The National Synchrotron Light Source at Brookhaven National Laboratory.

First visible light for machine testing emerges from the NSLS Vacuum Ultraviolet ring in 1982

Fast Facts

- The NSLS began operation in 1984 after four years of construction
- The building and synchrotron cost $160 million to build
- There are approximately 80 beamlines: 60 on the X-Ray ring and 20 on the VUV ring
- The booster ring accelerates the electrons to speeds up to 90% light speed
- The NSLS runs 24 hours a day, seven days a week, and over 250 days per year
- Over 2,000 scientists visit the NSLS each year to perform their experiments
- Hundreds of pounds of aluminum foil are used to help bake off impurities from the inner walls of the beam lines
- The NSLS electric bill is $2,000,000 a year

What is a Synchrotron?

Introduction

The human eye can see only visible light. It comes in the form of different wavelengths. These wavelengths are what create the colors of the rainbow. Other wavelengths of lights are not visible to the human eye. Although, we cannot see them, these types of light are also used in our everyday life. For example, a TV remote control uses infrared light to adjust the volume or change the channel of the TV. Airport scanners use X-rays to scan luggage. Tanning lamps use ultraviolet light to tan the skin. Microwave ovens use microwaves to cook your food.

What is a synchrotron?

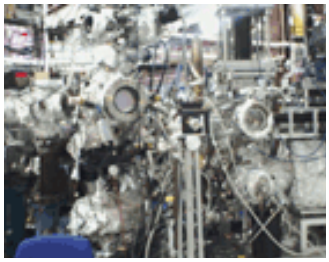
A synchrotron is a huge machine that produces very bright light of many different wavelengths. The light is much brighter than that found in your TV remote, microwave oven, or dentist's X-ray machine because the synchrotron beams of light are focused into very small spots. A synchrotron can be thought of as a giant microscope. It allows matter to be observed at the atomic scale.

How does it work?

The synchrotron produces light by accelerating electrons almost to the speed of light. Magnets put the electrons into circular paths. As the electrons turn, photons (little packets) of light are given off. The infrared, UV, and X-rays are sent down pipes called beamlines, to work areas where scientists run their experiments. The components of a synchrotron include an electron gun, linear accelerator, a circular booster ring (to increase the speed of the electrons), two storage rings (to re-circulate electrons), and beamlines. When this bright light is aimed at a very small sample, an image of the samples properties is created on a detector. This image is sent to a computer, which is used to analyze of the sample's molecular structure.

What's up with all the aluminum foil?

At the NSLS we use aluminum foil for the same thing you would at home, baking. The only thing different is that we don't just bake potatoes. Aluminum foil is one of the most used materials at the NSLS. Since the storage rings have to be maintained at such a high vacuum it is important to get all the molecules off the walls of the rings. Heating tape is wrapped around pipes to bake off any film. The aluminum foil is used to insulate the pipes.



The National Synchrotron Light Source: The National Synchrotron Light Source at Brookhaven National Laboratory is divided into two storage rings. The smaller of the two is called the VUV (vacuum ultra-violet) ring. This ring was completed in 1984 and has approximately 25 beamlines. It produces mostly UV, visible, and infrared light, although some X-rays are produced. The larger storage ring is called the X-Ray ring. It was completed in 1986 and has approximately 60 beamlines. This ring produces more of the higher energy x-rays than the VUV ring. The NSLS operates 24 hours a day and different experiments can be performed on most of the 80 beamlines simultaneously. Each year over 2,000 scientists visit the NSLS to perform experiments.

For more information, please contact:

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